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## C-A OPERATIONS PROCEDURES MANUAL

### 2.5.3.1 Procedure to Ensure Compliance with the NSRL Energy-Flux ASE

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#### Hand Processed Changes

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Approved: \_\_\_\_\_ *Signature on File* \_\_\_\_\_  
Collider-Accelerator Department Chairman      Date

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### 2.5.3.1 Procedure to Ensure Compliance with the NSRL Energy-Flux ASE

#### 1. Purpose

- 1.1 The purpose of this procedure is to provide instructions to MCR staff to limit particle energy-flux during [NSRL](#) operations in order to comply with the Beam Intensity Operational Safety Limits (OSL) found in [C-A OPM 2.5.3 NSRL Accelerator Safety Envelope Parameters](#).

The Beam Intensity Accelerator Safety Envelope (ASE) limits are:

- 1.1.1 The annual limit on the (product of) number and energy of nucleons extracted from the [NSRL](#) SEB system shall not exceed  $10^{17}$  GeV-nucleons.
- 1.1.2 The annual limit on the (product of) number and energy of nucleons deposited on the [NSRL](#) beam dump shall not exceed  $3 \times 10^{16}$  GeV-nucleons.
- 1.1.3 The hourly limit on the (product of) number and energy of nucleons extracted from the [NSRL](#) SEB system shall not exceed  $6 \times 10^{14}$  GeV-nucleons.
- 1.1.4 The hourly limit on the (product of) number and energy of nucleons entering the [NSRL](#) target room and beam stop system shall not exceed  $6 \times 10^{14}$  GeV-nucleons

#### 2. Responsibilities

- 2.1 The Operations Coordinator is responsible for the execution of this procedure.
- 2.2 MCR Operators are responsible for monitoring the Alarm Display Task (ADT).
- 2.3 The MCR Group Leader, or designee, is responsible to check periodically that “good” data is being saved.
- 2.4 The operator responsible for NSRL OSL reporting shall ensure the database contains accurate data, maintain the NSRL\_ASE Gpm application, and maintain the R line ion chamber logger application.
- 2.5 The NSRL Liaison Physicist (LP) is responsible for explaining to the users the necessity for periodic checks of beam transport efficiency and for ensuring that the 302 ion chamber cannot be retracted out of the beam.

### **3. Prerequisites**

- 3.1 The JEFFSTATS server or equivalent application server must be running to generate GPM alarms.
- 3.2 The NSRL\_ASE GPM is operational.
- 3.3 The Ion chamber at 302 feet in the beam line is always inserted into the beam.
- 3.4 The Ion chamber at 302 feet in the NSRL beam line is calibrated to within 10% accuracy.
- 3.5 Alarm Display (AGS) must be running to display GPM alarms.
- 3.6 A logger is running and logging the R line ion chambers.

### **4. Precautions**

- 4.1 Failure to follow this procedure could result in a violation of the Accelerator Safety Envelope.

### **5. Procedure**

- 5.1 Required software tools
  - 5.1.1 Verify that JEFFSTATS server, ADT, and the watchdog /GPM/Jeff/NSRL\_ASE.mon are running whenever [NSRL](#) is running.
  - 5.1.2 The MCR Group Leader (MCRGL), or designee, shall periodically verify that good data is being saved.
    - 5.1.2.1 IF good data is not being saved the MCRGL shall see that the situation is corrected within one day and shall estimate the impact of the error on the total counts used to monitor the hourly and yearly limits stated in paragraph 1.1
  - 5.1.3 Daily, the operators assigned to remote NSRL gate watch shall look at a NSRL\_ASE GPM display on a video monitor to verify that the application is using the correct ion species and energy for its accounting and report any non-conformance to the OC
    - 5.1.3.1 In the case of an NSRL\_ASE inconsistency, the OC shall log the inconsistency in the OC shift lot, and halt the NSRL program until the NSRL\_ASE inconsistency is corrected.

## 5.2 Required Instrumentation

- 5.2.1 The R line ion chamber at 302 feet must be inserted all the time. The dump ion chamber must be operational for use as backup in the event that the 302 ion chamber fails.

**WARNING:**

IF the 302 ion chamber fails, THEN the LP, or designee, will determine how long the program may continue or what alternative means will be used in order to continue monitoring the number of particles that contribute to the hourly and yearly NSRL ASE limits

- 5.2.1.1 The LP shall put a yellow do not operate tag on the local controls for the ion chamber insert/retract drive after the chamber is inserted.
- 5.2.1.2 The LP shall state on the do not operate tag the conditions under which the drive may be operated and who may operate the drive.
- 5.2.1.3 The LP shall provide calibrations for NSRL Ion Chambers to the MCRGL or designee.
- 5.2.1.3.1 Toggle switches to change IC gains will be posted with a sign that tells users to contact MCR before changing gains.
- 5.2.1.3.1.1 Gain Changes must be approved by the LP
- 5.2.1.3.1.2 The MCRGL, or designee, must be informed of gain changes.

## 5.3 NSRL Operation

**WARNING:**

IF NONE OF THE BEAM INTENSITY MEASURING INSTRUMENTS (BOOSTER CURRENT TRANSFORMER, and IC 302 IN R LINE) ARE CALIBRATED AND OPERATIONAL, AND D6 SEPTUM POWER SUPPLY IS ON THEN SETUP OF THE BOOSTER WITH BEAM MAY PROCEED ONLY IF THE RF IS TURNED OFF EARLY AND THE BEAM PREVENTED FROM REACHING THE EXTRACTION FLATTOP OF THE MAGNET CYCLE

### 5.3.1 Hourly Limits

**Note:**

IF 50% of the hourly limit for a parameter is exceeded, THEN a level III alarm will appear on the AGS ADT display. These alarms serve as a warning. The alarms are:

JEF.NSRL_EXTR_HRLY_TOT	range error	(for NSRL Extraction and)
JEF.NSRL_TGT_RM_HRLY_TOT	range error	(for the NSRL Target Room)

5.3.1.1 IF you see a level IV JEF.NSRL\_EXTR\_HRLY\_TOT range error alarm on the ADT, THEN 90% of the hourly limit for NSRL extraction has been exceeded.

5.3.1.1.1 Verify, by looking at the NSRL\_ASE Gpm, that the level causing the alarm does not exceed 90% of the hourly limit. IF the level causing the alarm is greater than 100% of the hourly limit, then stop the NSRL program, inform the LP that the ASE was exceeded, and follow the instructions in paragraph 5.3.3 to determine the amount of beam delivered in the previous hour. IF the level causing the alarm is between 90% and 100% of the hourly limit then follow the instructions in the next paragraph.

5.3.1.1.2 The OC shall inform the LP and curtail the program if instructed to do so. The OC shall also document in the OC shift log any program changes required by the LP.

5.3.1.1.3 The OC shall document the LPs instructions in the OC shift log

5.3.1.2 IF you see a level IV JEF.NSRL\_TGT\_RM\_HRLY\_TOT range error alarm on the ADT, THEN 90% of the hourly limit for beam in the NSRL target room has been exceeded.

5.3.1.2.1 Verify, by looking at the NSRL\_ASE Gpm, that the level causing the alarm does not exceed 90% of the hourly limit. IF the level causing the alarm is greater than 100% of the hourly limit, then stop the NSRL program, inform the LP that the ASE was exceeded, and follow the instructions in paragraph 5.3.3 to determine the amount of beam delivered in the previous hour. IF the level causing the alarm is

between 90% and 100% of the hourly limit then follow the instructions in the next paragraph.

- 5.3.1.2.2 The OC shall inform the LP and curtail the program if instructed to do so. The OC shall also document in the OC shift log any program changes required by the LP.

## 5.3.2 Yearly Limits

**Note:**  
NO 50% ALARMS WILL BE GENERATED FOR YEARLY PARAMETER LIMITS

- 5.3.2.1 IF you see a level IV JEF.NSRL\_EXTR\_YTD\_TOT range error alarm on the ADT, THEN 90% of the YEARLY limit for NSRL extraction has been exceeded.

- 5.3.2.1.1 Verify, by looking at the NSRL\_ASE Gpm, that the level causing the alarm does not exceed the yearly limit. IF the level causing the alarm is greater than the yearly limit, then stop the NSRL program, and inform the LP that the ASE was exceeded. IF the level causing the alarm is between 90% and 100% of the yearly limit then follow the instructions in the next paragraph

- 5.3.2.1.2 The OC shall inform the LP and curtail or stop the program if instructed to do so. The OC shall also document in the OC shift log any program changes required by the LP.

- 5.3.2.2 IF you see a level IV JEF.NSRL\_BM\_SP\_YTD\_TOT range error alarm on the ADT, THEN 90% of the YEARLY limit for beam in the NSRL beam stop has been exceeded.

- 5.3.2.2.1 Verify, by looking at the NSRL\_ASE Gpm, that the level causing the alarm does not exceed the yearly limit. IF the level causing the alarm is greater than the yearly limit, then stop the NSRL program, and inform the LP that the ASE was exceeded. IF the level causing the alarm is between 90% and 100% of the yearly limit then follow the instructions in the next paragraph.

- 5.3.2.2.2 The OC shall inform the LP and curtail or stop the program if instructed to do so. The OC shall also document in the OC shift log any program changes required by the LP.

### 5.3.3 Problems with the NSRL\_ASE GPM

**Note 1:**

“Non-physical” measurements may add incorrect data to the integrated total which operations uses to regulate the amount of beam dumped and stay under OSLs outlined in this procedure.

In order to stay in compliance with this procedure, determination of the beam that was extracted prior to the incorrect data point must be made. This value will be used to make temporary adjustments to the hourly beam flux limits outlined in this procedure.

#### 5.3.3.1 IF an incorrect data point is observed THEN:

**Note 2:**

The source of the non-physical data should be determined and corrected prior to completing steps 5.3.3.1.1 to 5.3.3.1.8. Be sure the arithmetic is done in the same (nucleon) units

- 5.3.3.1.1 Determine the last hour's NSRL extracted beam by using the NSRL\_ASE logger (LogView/MCR/NSRL\_Ops/NSRL\_ASE.logreq). The hourly totals are listed as BST.\_EXT\_HourTot, and NSRL\_Troom\_HourTot.
- 5.3.3.1.2 Subtract the last valid hourly totals from the hourly beam flux limits defined in steps 1.1.3 and 1.1.4. Use these as representative hourly limit and follow this procedure
- 5.3.3.1.3 Stop and start NSRL\_ASE Gpm, which will reset the totals. Monitor the hourly totals and ensure that they do not exceed the representative hourly limit derived in the previous steps.
- 5.3.3.1.4 After 20 minutes of running, determine the net change in the last 20 minutes of the logs listed in 5.3.3.1.1 and apply this change to the representative hourly limits. (In this case the data used will contain the non-physical data points but these points will cancel out in determining the net change.

- 5.3.3.1.5 Use these new numbers as representative hourly limits to be respected by this procedure
- 5.3.3.1.6 After another 20 minutes has passed, repeat 5.3.3.1.4 and 5.3.3.1.5 above
- 5.3.3.1.7 After an hour has passed, respond to dumped beam totals and limits as displayed by NSRL\_ASE.
- 5.3.3.1.8 IF the (hourly) data needs correcting, THEN the MCRGL shall also ask the operator who maintains the data to correct the database so that the yearly data is accurate.

#### 5.4 Control of Losses in the beam transport.

- 5.4.1 The LP shall explain to the users the need for periodic checking of the beam transport efficiency
- 5.4.2 The NSRL operator shall check the beam transport efficiency at the start of the day, and every four hours “while operating” thereafter.
- 5.4.3 The NSRL operator shall check the transport efficiency by inserting the R63 ion chamber, or the upstream most functioning ion chamber and by measuring the transmission to the 302 ion chamber. IF the transmission is not 90% or better, THEN the operator shall tune the beam or ask the LP for assistance.
  - 5.4.3.1 Notification shall be given to the experimenters before an upstream ion chamber is inserted.

### 6. **Documentation**

None

### 7. **References**

- 7.1 [C-A OPM 2.5.3 “NSRL Accelerator Safety Envelope Parameters”](#)

### 8. **Attachments**

None